



SECONDARY BEAM LINE TRIM SEXTUPOLE

S. C. Snowdon

October 27, 1970

PURPOSE

To design a trim 6-pole magnet for use in secondary beam lines.

METHOD

An extension of the conformal transformation to cover the case of a 6-pole magnet has been carried out. The resulting program SIXPOLE incorporates the COIL subroutine of previous magnet codes to simulate coils by a finite number of current carrying wires.

RESULTS

Table 1 gives the pole profile as given by SIXPOLE. Table 2 completes the design and performance parameters. Figure 1 shows one quadrant of the 6-pole magnet. Each axis is a line about which mirror symmetry may be employed to visualize the complete magnet. No calculations with finite permeability have been made because of the modest flux densities involved.



Table 1 Pole Profile Segments

x(in)	y(in)	x(in)	y(in)	x(in)	y(in)
.000	2.125	2.315	2.605	1.840	1.063
.113	2.131	2.245	2.555	1.886	.991
.223	2.148	2.157	2.493	1.972	.881
.301	2.168	2.075	2.437	2.028	.823
.401	2.201	1.981	2.374	2.106	.753
.515	2.250	1.898	2.318	2.186	.693
.597	2.293	1.814	2.260	2.285	.629
.710	2.362	1.742	2.199	2.400	.566
.810	2.434	1.708	2.147	2.513	.516
.912	2.502	1.710	2.041	2.623	.460
1.005	2.552	1.703	1.919	2.713	.406
1.034	2.608	1.691	1.796	2.775	.409
1.050	2.701	1.687	1.664	2.864	.441
1.059	2.803	1.693	1.546	2.957	.485
1.065	2.903	1.705	1.447	3.047	.529
1.073	3.015	1.727	1.345	3.148	.578
1.081	3.114	1.749	1.267	3.238	.621
1.090	3.222	1.801	1.138	3.335	.667
1.099	3.307	1.840	1.063	3.413	.702

Table 2 Six-Pole Parameters

Six-Pole Strength	1.825 kG/in <sup>2</sup>
Aperture	4.250 in
Width of Good Field	4.000 in
Magnet Length	30.0 in
Coil Turns per Pole	12
Copper Conductor Cross Section	.34 in x .34 in
Water Cooling Hole Diameter	.15 in
Conductor Corner Radius	.03125 in
Conductor Current (approximate)	500 A
Current Density in Conductor	5150 A/in <sup>2</sup>
Average Conductor Turn Length	68.25 in
Coil Resistance per Pole	.006175 Ohm
Voltage Drop per Pole	3.09 V
Power per Pole	1.54 kW
Cooling Water Pressure Drop	200 psi
Number of Water Paths per Pole	1
Water Flow	.69 GPM/pole
Temperature Rise	8.5°C (15.3°F)
Outside Dimensions (approximate)	11.25 in x 12.00 in



**national  
accelerator  
laboratory**

Author  
S. C. Snowdon

Section  
Accel. Theory

Page  
4 of 4

Date  
10/26/70

Category

Serial  
TM-273  
0650

Subject

## SECONDARY BEAM LINE TRIM SEXTUPOLE

STRENGTH 1.825 kg/in<sup>2</sup>

APERTURE 4.25 in

GOOD FIELD WIDTH 4.00 in

RUN SIXPOLE (10/22/70)

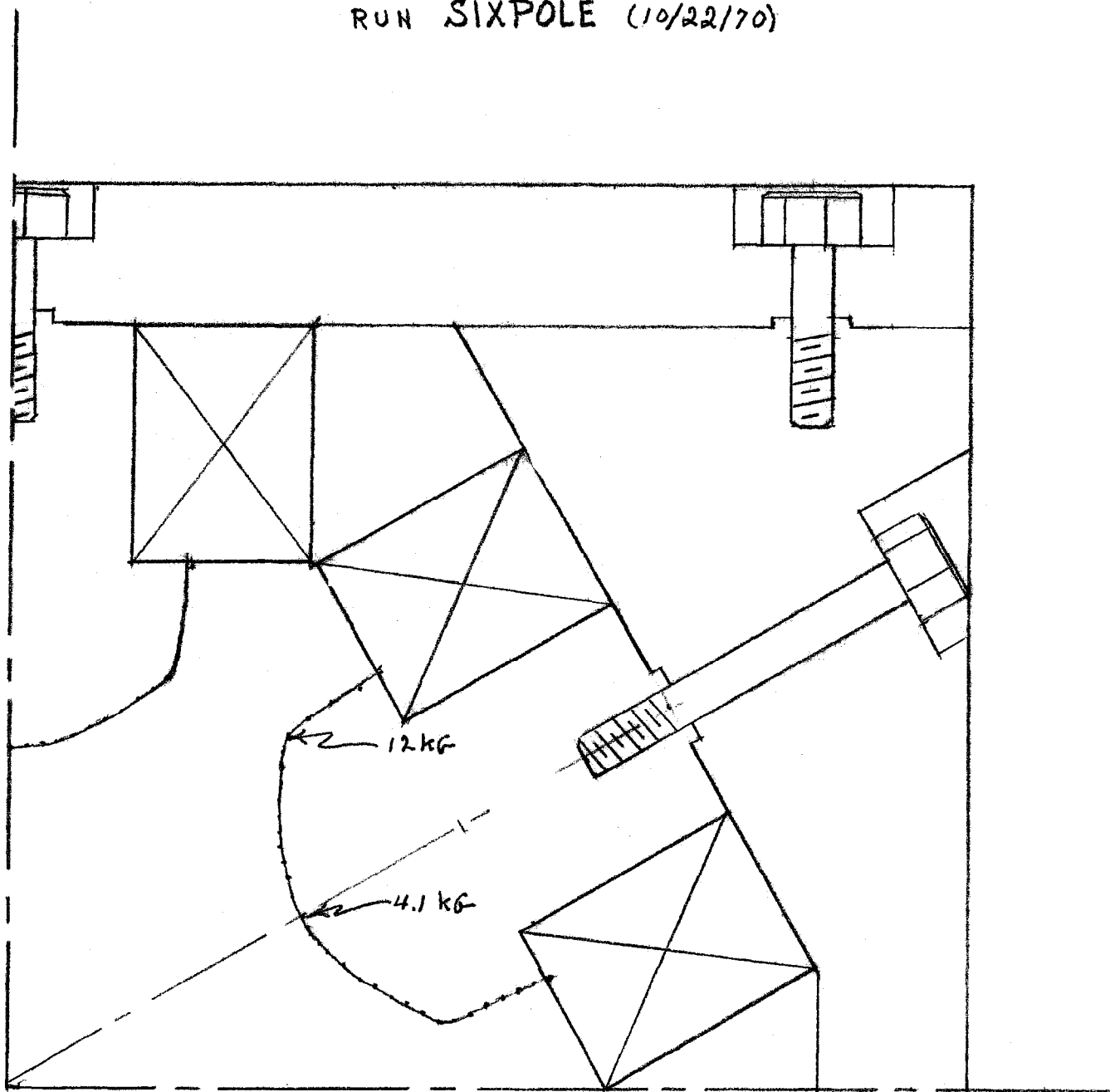


FIG. 1